F·A·A·M facility for airborne atmospheric measurements

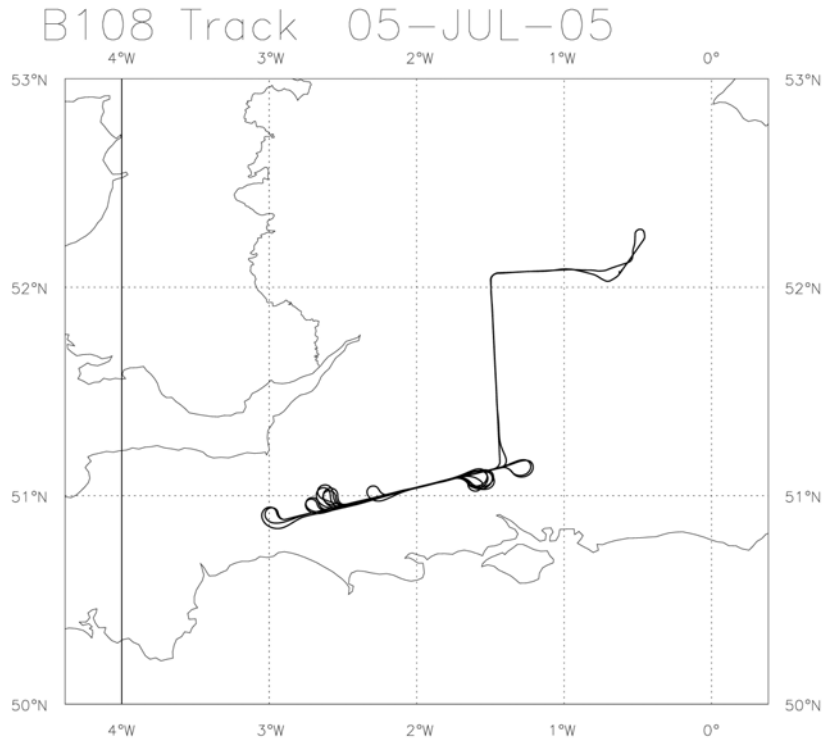
FLIGHT FOLDER

Flight No.:	B108
Date:	05 Jul 2005
Take Off	10:48:21Z
Landing:	15:40:48Z
Flight Time	4h52m27s

Campaign: CWVS
Trials Instructions:
Operating Area: SW

POB	Position	Name	Institute
1	Captain	Alan Roberts	Directflight
2	Co-pilot	Ian Ramsay-Rae	Directflight
3	CCM	Gaynor Ottoway	Directflight
4	Mission Scientist 1	Jonathan Smith	Leeds University
5	Flight Manager	Jim Crawford	FAAM
6	Cloud Physics	Jamie Trembath	FAAM
7	CVI / CCM2	Paul James	FAAM
8	CCN / AMS	Jonny Crozier	Manchester University
9	ADA/CPI	Paul Connolly	Manchester University
10	Mission Scientist 2	Dave Kindred	Met Office
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

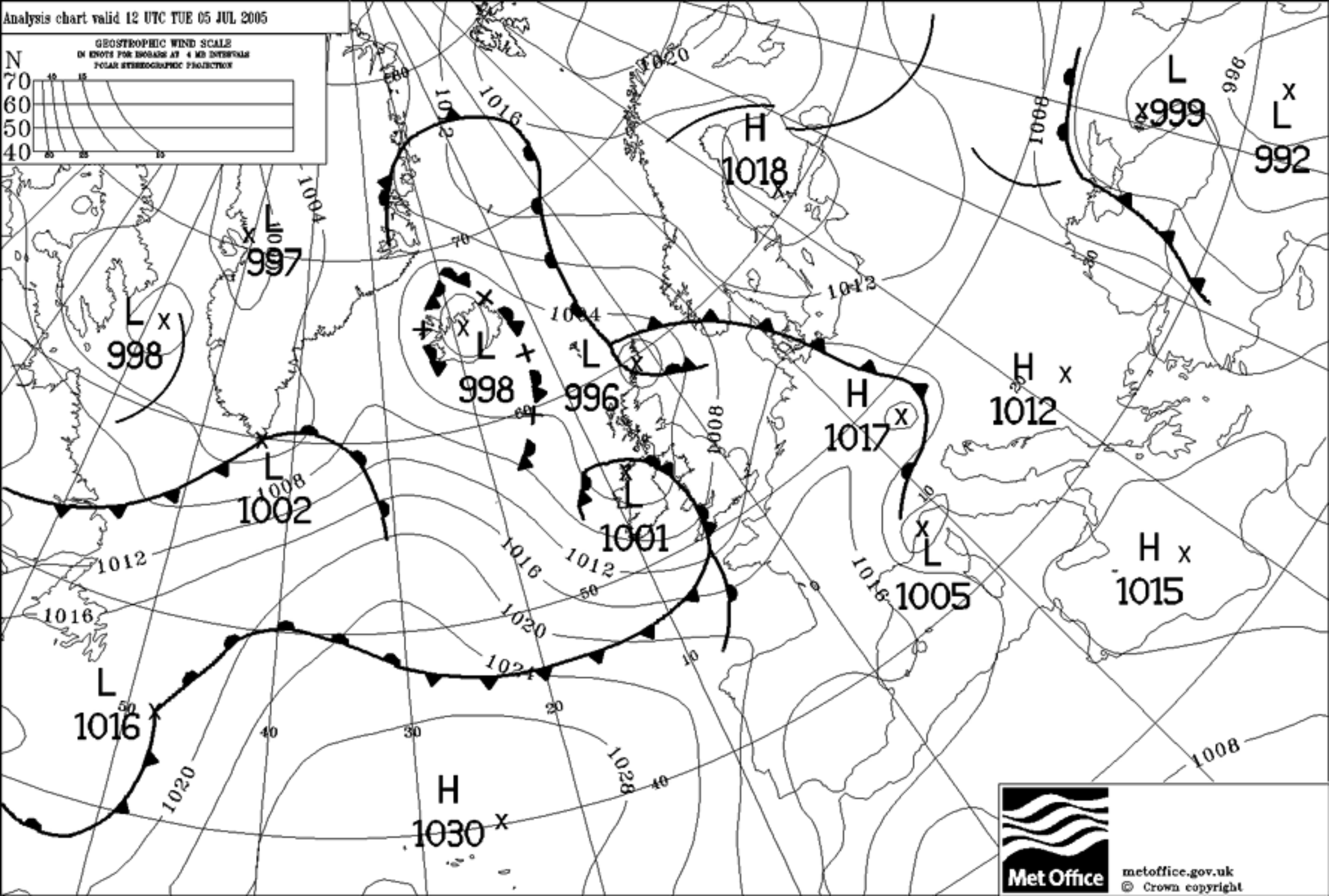
Flight Track:



FLIGHT SUMMARY

Flight No b108
Date: 5 July 2005
Project: CWVS
Location: Chilbolton

Start Time	End Time	Event	Height (s)	Hdg	Comments
103301		INU to nav	0.42 kft	128	Cranfield 52'04.36N 0 00'37.48W
103553		engine start	0.42 kft	128	
103735		power change over	0.42 kft	128	
104821		T/O	4.4 kft	299	Cranfield 10:48:21
105202		ASPs	5.0 kft	279	ASPs open
105322		videos recording	5.0 kft	258	FFC (left) & DFC(right)
110541		HORACE/DRS/DLU	5.0 kft	180	check satis
111507	111510	Profile 1	5.0 kft	248	from 5000'
112909		interrupt profile 1	18.0 kft	257	int at fl 180
113439		restart profile 1	18.0 kft	073	fl180 - 200/220
113605		Nev & JW cals	19.5 kft	073	
113835		end profile 1 & start run 1.1	22.0 kft	070	fl 220
114139		end Run 1.1	22.0 kft	080	
114539	115340	Run 1.2	22.0 kft	255	fl220
115756	120335	Run 2.1	20.0 kft	088	towards Chilbolton
120609		video	16.5 kft	327	left recorder to RFC
120712	121639	Run 3.1	16.5 kft	259	fl 165
120908		nev JW cal	16.5 kft	257	
122125	122726	Run 4.1	13.0 kft	088	
123118	123257	Profile 2.1	15.0 - 17.0 kft	257	
123258	123525	Profile 2.2	17.0 - 15.0 kft	254	
123526	123641	Profile 2.3	15.0 - 15.4 kft	256	brief interruption
123720	123909	Profile 2.4	15.4 - 19.3 kft	254	should read 17.0kft
123909	124208	Profile 2.5	19.3 - 15.0 kft	257	should read 17.0kft
124520	124747	Profile 3.1	14.0 - 12.0 kft	082	
124747	125018	Profile 3.2	12.0 - 14.0 kft	073	
125018	125243	Profile 3.3	14.0 - 12.0 kft	074	
125150		nev zero			
125517		overhead Chilbolton	13.0 kft		eastbound
130000		overhead Chilbolton	13.0 kft		westbound
130000	130341	Profile 3.4	13.0 - 10.0 kft		
130341	131621	Run 5.1	10.0 kft	254	
131954	132955	Run 6.1	12.0 kft	079	
132147		nev zero	12.0 kft	072	
132640					DITM in error
133131					DITM heater on
133314					DITM heater off
133334	134238	Run 7.1	16.5 kft	256	
133628		video tapes changed	16.5 kft	256	
134652	135212	Run 8.1	18.0 kft	071	
134727		nev zero	18.0 kft	064	
135538	140448	Run 9.1	16.5 kft	251	
135734		nev & jw zeros	16.5 kft	257	
140831		nev zero	13.0 kft	091	
140845	141622	Run 10.1	13.0 - 11.7 kft	082	
141903	142448	Run 11.1	11.5 kft	259	
142807	143453	Run 12.1	13.0 kft	066	overhead Chilbolton at 143453 eastbound
144024			13.0 kft		overhead Chilbolton westbound
144431	145027	Run 13.1	9.5 kft	252	
145037	145250	Profile 4	9.5 - 7.5 kft	253	
145625	145908	Profile 5	7.6 - 5.0 kft	081	
145933		Run 14.1	5.0 kft	075	
150743			5.o kft		overhead Chilbolton
154048					land Cranfield


Analysis chart valid 12 UTC TUE 05 JUL 2005
GEOSTROPHIC WIND SCALE
IN KNOTS FOR ISOBARS AT 4 MB INTERVALS
POLAR STEREOGRAPHIC PROJECTION
N
70
60
50
40
L 998
L 997
L 998
L 996
L 1002
L 1001
L 1016
H 1018
H 1017
H 1030
H 1012
H 1015
L 1005
L 999
L 992
1004
1008
1012
1016
1020
1024
1028
Met Office
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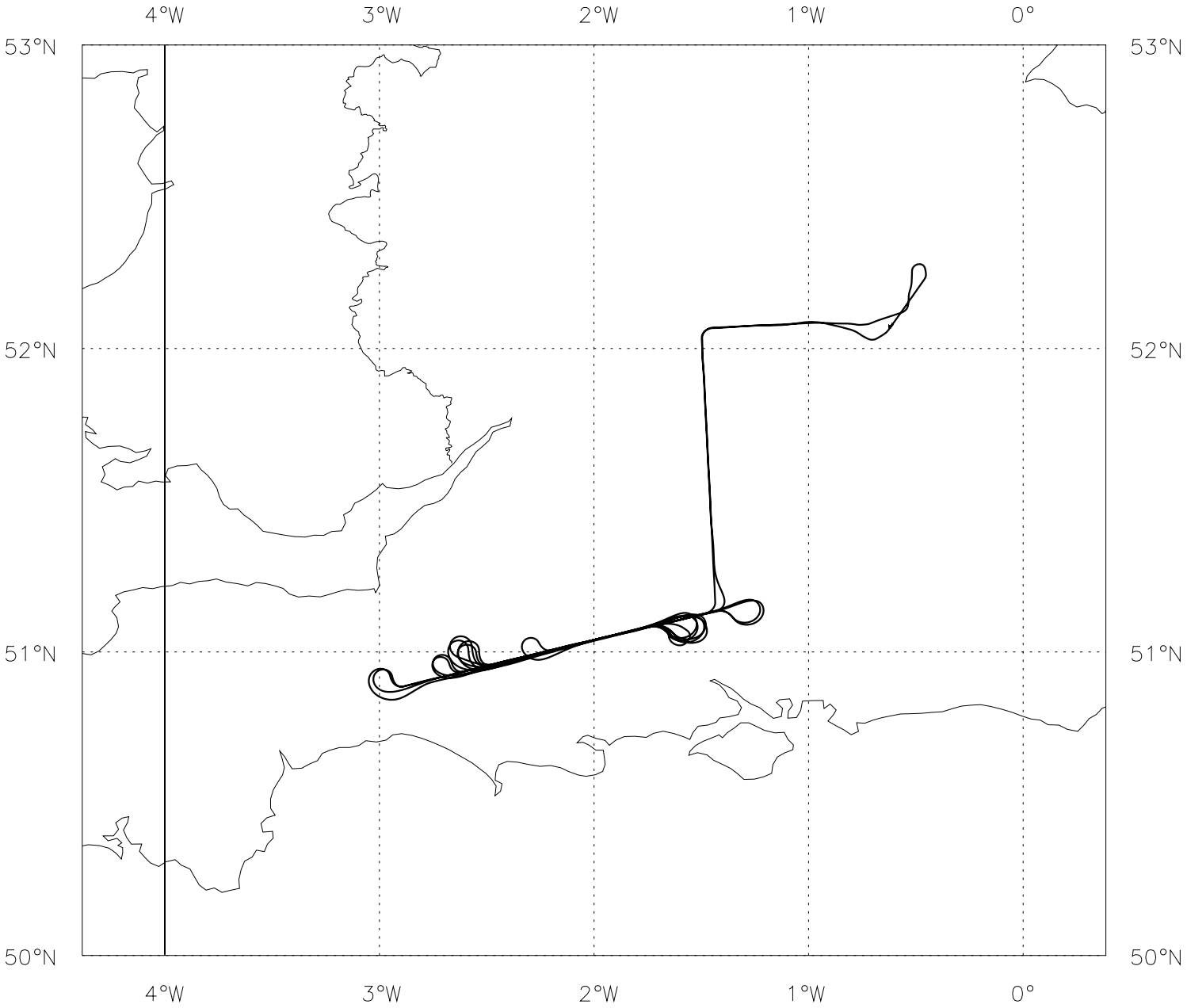
B108 Track 05-JUL-05



PROJECT BRIEF: CWVC – mixed-phase cloud studies (KNB 04/07/05)

Scientific Aims: The purpose of this project is to obtain detailed microphysical measurements in stratiform cloud systems that lie within the temperature regime in which mixed-phase clouds are possible (typically 0 to -30C). In particular, we wish to examine the competing roles of

- primary ice nucleation
- secondary nucleation via the Hallett-Mossop process, in which new ice particles are generated during the riming growth of larger ice particles.
- other secondary ice nucleation mechanisms such as evaporative break-up
- the dependence of these processes on the dynamical environment within the cloud (and in particular the strength of embedded convective updraughts)

In-situ measurements from the aircraft are performed in close coordination with the Camra radar facility at Chilbolton, Hants. The radar may identify features such as embedded convective cells or layers of supercooled liquid water that can be investigated more intensively by the aircraft. Similarly, the aircraft can provide information on microphysical characteristics to aid interpretation of the radar data.

Weather conditions: A stratiform cloud band lying over or to the west of the Chilbolton radar facility. This may or may not be generating precipitation at the surface. It is particularly desirable if the mean wind direction lies between about 220 and 280 degrees. This allows the aircraft to fly legs along the radar beam whilst staying closely parallel to the mean wind direction, and hence to more easily penetrate identifiable cloud features on successive runs at the same altitude. Note that to avoid interference with Bournemouth airport, Chilbolton is NOT allowed to transmit in the sector 209 to 219 degrees true.

Key instruments and their operation.

Basic meteorology

- Rosemount temperatures, GE hygrometer
- GPS, INU, turbulence probe – When in supercooled liquid water, Flight Manager or PIs should monitor turbulence probe calibrated differential pressures for signs of icing (cessation of variability on signal).

Cloud Physics

- FFSSP, 2DC, 2DP, PCASP, SID-1 (and SID-2). Normal monitoring to ensure correct operation. Operator should note particular features of interest eg. high concentrations, appearance of pristine ice crystal habits, appearance of large drops (>100micron) in 2D imagery when above freezing level.
- ADA/CPI – as above
- CCN measurements should be made by filling the alleviator whilst in clear air either below, between or upwind of the cloud layer(s) of interest.
- If functional, the Ice Nucleus counter (INC) will normally be operated in clear air and under fixed conditions of temperature and supersaturation so as to maintain it in a stable condition. Allow additional time between runs for the operator to adjust it to a different set of conditions.
- J-W LWC and Nevzorov LWC/TWC. Where a run is only partially in cloud and is starting in clear air, these should be zeroed/calibrated and a note made in the Flight Manager's log.
- TWC. If possible, a profile in clear air is desirable for calibration purposes.

Sortie Brief: CWVC – mixed-phase cloud studies **Date: 5th July 2005**
Flight Number: B108 **M.Sci: Jonathan A. Smith, Dave Kindred**

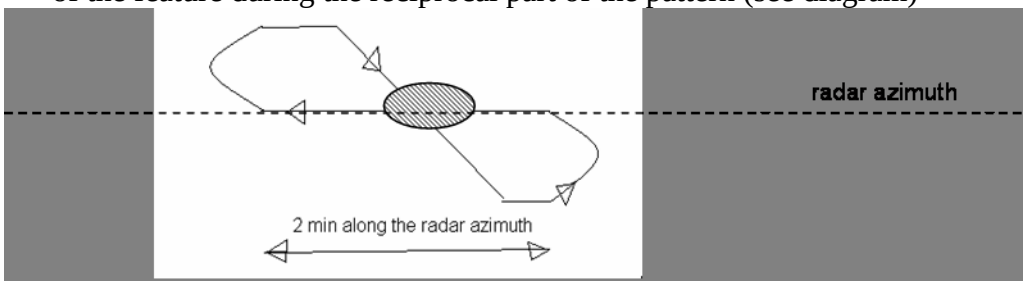
Sortie Aims: To measure ice and liquid-phase microphysical processes and cloud dynamics in stratiform cloud systems in association with Chilbolton radar.

Sortie Location: Within a stratiform cloud system over/to the west of Chilbolton radar facility.

Sortie Summary: Perform a series of runs along the azimuth that is being scanned by the radar. Information on the run orientation and altitude to be flown will be provided by scientists at Chilbolton using VHF radio (call-sign "Radsearch"). Where the radar identifies a small-scale feature of interest, the aircraft may abort a long leg in order to turn to re-penetrate it. In this case, the aircraft may fly a small butterfly pattern in which only one of the legs is parallel to the wind direction or radar azimuth. Where either the aircraft or radar identifies a particular horizontal layer of interest, the aircraft may fly a sawtooth pattern so as to provide a sequence of profiles. On occasion, the aircraft flight legs may start/finish in the Chilbolton overhead. This benefits the validation of vertically-pointing radar/lidar retrievals of supercooled cloud layers. This requires turns to be done within controlled airspace and so will limit the number of occasions that this is possible.

Sortie Detail:

a) T+0 Take off & climb to FL50 to transit to operating area west of Chilbolton.
b) T+20 When in a suitable location descend from transit altitude to 1000ft agl (or to lowest altitude allowed by operating restrictions) or to1000 ft below the freezing level. Perform a profile ascent at 1000ft/min along the azimuth and through the cloud system up to FL280 or to above cloud top (whichever is lower) (40 min)
c) T+60 Establish start/end points of 40-60km of level flight legs along the azimuth which is being scanned by the radar. Fly these legs at altitudes defined by the radar or as determined from previous profile. Duration of each leg ~ 5-10 minutes. Some legs may be extended into the overhead position of Chilbolton when requested from the ground.
d) Where the radar identifies a feature of interest that is penetrated by the aircraft along any leg, the leg may be interrupted to fly one or more butterfly patterns. Each butterfly consists of a minimum of two minutes straight/level that includes penetration of the feature followed by turns that allow re-penetration of the feature during the reciprocal part of the pattern (see diagram)



e) Where a defined layer of interest (such as a shallow layer of supercooled liquid water) is identified by the aircraft or radar, the long leg may be flown as a sawtooth leg with ascents/descents at 1000ft/min, extending 1000ft above and below the layer level (M.Sci may request level segments of 1 minute).
f) Repeat items c) to e) as long as flight endurance or cloud conditions permit.

Mission Scientist's Log

Flight No B 108   Date 5/7/05   Page .... of ....

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1040					Start Taxi
1048				}	T/O Cranfield.
					2/8 Cu 8/8 Ac/As above.

Chilbolton

Radio where we are

run ahead

Mission Scientist's Log

Jonathan Smith

Flight No **B**...108.... Date 5th July '05 Page ...1... of ...7...

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
10:49	T/O				8/8 Sc, hazy
"	climb	2800			Cbase small cu, few hundred feet deep
					4/8 Cu below 8/8 Sc above, 1/8 St below
10 53	transit	5000	270		Sc layer base appears to be lower ahead, still above at moment
1055	"	"	262		at cb of Sc T = +4°C
1057				52N 1.4W	met midscreen ↓
					2D 300 µm CPI small & large
11:01	"	"	181		much brighter now - no drops
					streaming on midscreen now
					LWC on 2D/N is 0.1 gm^{-3}
11:05	"	"	180	51.6N 1.4W	darker outside LWC approx. same
11:08					contact with Rad search
11:11					peak LWC of 0.8 gm^{-3}
	start P1		248		in cloud, quite bright LWC ~0.2 g/m^3
11:16	P1	6200	243		a cloud top Sc
	P1	6900			clearer again 7/8 Sc above
					clear to port on horizon
					wind 13 m/s 237 deg
11:20	P1	9800			back into cloud, base of upper layer
					LWC 0.2 gm^{-3}
11:22	P1	11000			snow on 2D & CPI
					clear blue sky to port.
11:23					ice crystals - readings on 2D

Mission Scientist's Log

Flight No **B**...108... Date ...5th July... Page ...2... of ...7...

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
11:25					weather radar has many
					lines stopping from Severn River
					mouth/ estuary south Weymouth
					Portland Bill
11:33		14600			top of Sc level for a while
					snow on 2D
		17000			pass higher tops (hazy layer of Cl
					Cb ahead - much higher) at this level
Cloud →	13000 / 20000				
	Kelvin Helmholtz				
	lower levels after that				Plan
Cloud "	high 2/2R →			5-6km "	← 220
					200 →
					← 165
					130 →
11:45	just miss the airway, on purpose				Air traffic are amused
					CCN fading sample
can see 90 km	/ 70 or			80 km	as length
11:48				43 nm	pass through higher cloud
					nice tunnels ahead
	or pass	cloud was			mixed phase CPI T-24 2D
					25-50 μm
					CCN looks ok 2 samples Bgo
11:53	end R1.2				no cloud above 1/8 Cs at last 1/8 Cu
					8/8 Sc below CCN 4/5 samples

AC

Mission Scientist's Log

Flight No **B**...108..... Date 5th July '05 Page 3 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
~~B~~	~~R~~1	FL200	"in" 88		"~~convective~~ ~~structure~~ 20km gust"
1201					2D ~~sees~~ ~~some~~ snow ~~must~~
					be some small cloud
12.02					"large snow" 2D, + approach
					small – "snow on camera"
	R3.1				"~~convective~~ ~~turrets~~ 20km away"
12:09					into the cloud "seen on radar"
					snow + small patches – 2D
					all liquid cloud
12:13	updraft is ± 2 m s^{-1}				
	and R3.1				in clear
12:21:18					into cloud – asked for turn
					Nav. may have been ok?
just going in & out of tops on this run					
					"~~sawtooth~~ 4→
					130 165"
~~12~~					into ~~the~~ line of cloud/snow
					170 → 150 ~~sawtooth~~
1225					CPI sees rimed clumps +2D
1226		13000			mixed phase on 2D T -7°
1231					2D saw some lovely ~ - - -
					2D seeing bits of ~ - - -
12:32:20					out of tops
					"120-140 + overhead"
					out at 100 130

Traffic above

Mission Scientist's Log

Flight No **B**...108... Date ...5th July..... Page 4 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
12:39:33				50°N 2°W	traffic again – now no
					Grant ahead of us, no higher
					cloud here 8/8 Ac
					ice crystal cloud in distance
Out of cloud momentarily –					"FL100 on return"
1251					Nav zeroed, about enter cloud
					again
1252					2D sees small pristales maybe drops
					CPI ~~maybe~~ drops also T-4.5
12:53:14					CPI sees columns (+2D as well)
12:54:03		10km away at			FL130 T-6°C
12:55:14					overhead Chilbolton
					near tops of cloud CPI columns
					plates drops spotted
	"slight differential Z/dR" at this time				
12:57:24					CPI graupel, 2D yes + now snow
					some 3 mm across
12:59:25				T-6°C	2D spherical pristles temperline
	can see second	bird of rain	beyond	80km at 100km	
13:03:40					2D small stuff CPI – droplets
13:03:41	R5.1	start FL100			"thin layer at 12000, clear
					2.0km wide, 70km distance
					try and skim layer at 12000"
130739					pass under the layer?
1310					500μm & 200μm drops

then large snow!

Mission Scientist's Log

Flight No **B**108 Date 5th July '05 Page 5 of 7

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
13 11:18	5·1	10,000	255	50·9°N 2·4°W	T −1·7°C
1313					250μm droplets – clear images
131554					CPI droplets up to 50μm
					medium Ac with embed Cu
					3/8 below, no cloud above
13 19 15		12000		T−5·6°C	droplets + a few columns
13 [illegible] 10					rain
					"16500 ft for out"
13 27 30		12 000			in a thin cloud layer or haze
					"3·5km" 11000 ft ?
					Cb to N
13·34	R71	FL 165	251		T −14.6
					next run higher to skim top
	near tops of convective cloud				
	Dried temperature probe has broken				
					180
				T ~ −12°	Large irregular ice 2mm?
					+ small droplets ~ 20μm
	out R71				no cloud above, 3/8 Ac
					"out of cloud 30km from Chilbolton"
13·45:m		FL180	186		~ haze layer or Ci at this level cloud
					very near top, nothing on
					radar at this altitude
					some turbulence (slight) approx ±
					updraft was ~ ±2 m s⁻¹

"out of cloud turn" "FL165 on outbound"

Mission Scientist's Log

Flight No **B**108 Date 5th July Page 6 of 7

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
	"70	km out	B	FL 130	for next inbound"
crossed	B	8km	to Chilbolton		on turn
	9.1				approaching system again
					no Ci above
					nothing on weather radar (v.
					bumpy
14:00:20	start				"all ice" on pass thro' system
	10.1	130			miss the system then turn
					skim tops of system to starboard
					just under top of system to port
	" next out at		FL115		outbound)
14:17					TAll angular, V. large 6000μm drops
14:19:03	11.1	115			Start R 11.1
					only droplets, + patch of
1h:19 or so					mixed phase
1h:20					only droplets,
					back at FL130" overhead
					"not much beyond 50km"
1h:~~30~~		FL130	74		just over top of system
					T -4.5°C
					layer of Ds to starboard
1h:					16 km
out					droplets + bit of ice
1h ~~40~~	overhead		Chilbolton		
1438	10km E of		↑		

Transit FL050

~18000 Most Tops (6cm) 20-22kft

6900
5000

P1 22.0 5.0

Land

R1.1 → 22.0kft

1.2 ← 22.0kft

2.1 → 20.0kft

3.1 ← 16.5kft

4.1 → 13.0kft

S/T P2 17.0kft (18kft)
15.0 (16 kft)

S/T P3 14.0kft
12.0kft

5.1 ← 10.0kft.

6.1 → 12kft

7.1 ← 16.5kft

8.1 → 18.0kft

9.1 ← 16.5kft

10.1 → 13.0kft

11.1 ← 11.5kft

12.1 → 13.0kft O/H ②

13.1 ← 9.5kft

P4

P5

14.1 → 5.0kft

De-iced Temp ?

T/O 1048

Land 1541.

4:53

De-Brief 17.15

Return Transit 050.

CLOUD PHYSICS LOG

Flight No. B108 **Date: 05/07/05** **Operator: JT** **Page 1 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
11:15:07	337	0.7	484	3000	262	375	1	841	200	1	P1 Ascent from FL50
11:16:10	12	0.8	521	0	0	0	0	0	0	0	FL60
11:17:16	16	0.1	525	0	0	0	0	0	0	0	70
11:18:24	17	0.09	525	0	0	0	0	0	0	0	80
11:19:33	21	0.09	527	3000	107	75	?	0	0	0	90 (FFSSP dau slow by 1.5s)
11:20:40	10	0.5	573	3000	18	800	3	50	3000	3	100
11:21:50	14	0.1	587	10	14	325	6	1483	1000	6	110
11:22:50	70	0.24	588	100	52	600	6	2100	1000	6	120
11:23:50	3	0	592	1000	174	750	3	7800	3000	3	130
11:24:50	97	0.57	605	700	195	800	3	6633	3000	3	140
11:26:04	19	0.1	616	0	0	0	0	0	0	0	150
11:27:07	46	0.12	624	0	0	0	0	0	0	0	160
11:28:10	132	0.13	624	0	0	0	0	0	0	0	170
11:29:08	92	0.11	624	0	0	0	0	0	0	0	FL180 P1 interupted
11:34:38	206	0.1	624	0	0	0	0	0	0	0	P1 restarted FL180
11:35:36	8	0.09	624	0	0	0	0	0	0	0	FL190
11:35:33	4	0.07	624	0	0	0	0	0	0	0	200
11:36:31	10	0.09	624	0	0	0	0	0	0	0	210
11:38:36	40	0.35	628	1000	500	800	3	Missed data	1000	3	220 end of P1 and start of run 1.1
11:41:35	16	0.9	628	0	0	0	0	0	0	0	end Run 1.1 FL220
11:45:18	14	0.09	628	0	0	0	0	0	0	0	Start run 1.2 @ FL220
11:47:00	12	0.11	628	0	0	0	0	0	0	0	
11:49:00	7	0.11	630	0	0	0	0	0	0	0	Passed through turret, mixed phase
11:51:00	5	0.14	630	0	0	0	0	0	0	0	
11:53:00	11	0.1	630	0	0	0	0	0	0	0	
11:53:40	19	0.1	630	0	0	0	0	0	0	0	End of run 1.2
11:57:55	39	0.09	630	0	0	0	0	0	0	0	Start run 2.1 @ FL200
11:59:00	39	0.09	630	0	0	0	0	0	0	0	
12:01:00	39	0.09	630	0	0	0	0	0	0	0	Passed through turret
12:03:33	29	0.1	633	0	0	0	0	0	0	0	End of run 2.1
12:07:11	63	0.14	659	0	0	0	0	0	0	0	Start run 3.1 @ FL165
12:09:00	218	0.65	661	3000	127	800	8	4741	4000	8	

CLOUD PHYSICS LOG

Flight No. B **Date:** **Operator:** **Page 2 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
12:11:00	183	0.12	678	0	0	0	0	0	0	0	
12:13:00	155	0.12	681	0	0	0	0	0	0	0	Missed turret again snow
12:15:00	140	0.11	681	0	0	0	0	0	0	0	Changing record method to
12:16:37	33	0.09	681	0	0	0	0	0	0	0	Take in turrets End of run 3.1
12:21:25	106	0.11	683	3000	161	250	1	5625	250	1	Start Run 4.1 @ FL130
12:23:00	101	0.1	690	0	0	0	0	0	0	0	
12:24:14					1615	200	1	2985	300	1	
12:25:00	16	0.1	692	0	0	0	0	0	0	0	
12:25:42					455	800	5	39566	1000	5	
12:27:26	15	0.69	712	3000	500	425	8	2075	800	8	End of run 4.1
12:31:18					33	775	3	983	3000	3	Start saw tooth @ FL 150
12:32:					small	Small	1				Fl 160
12:33:59	256	0.13	769	0	0	0	0	0	0	0	FL 170
12:34:10	254	0.11	769	0	0	0	0	0	0	0	FL 160
12:35:16	221	0.11	769	0	0	0	0	0	0	0	FL150
12:36:20	Nothing	Of	Interest								153 interup
12:37:05	Nothing	Of	Interest								FL 153 restart
12:38:00	107	0.12	769	0	0	0	0	0	0	0	FL 160
12:39:02	18	0.09	769	0	0	0	0	0	0	0	FL170
12:40:45	15	0.09	769	0	0	0	0	0	0	0	FL160
12:41:52	51	0.1	769	0	0	0	0	0	0	0	FL 150 end of saw tooth
12:45:18	50	0.11	770	0	0	0	0	0	0	0	Start saw tooth @ FL 140
12:46:28	316	0.12	770	0	0	0	0	0	0	0	FL 130
12:47:37	388	0.12	770	0	0	0	0	0	0	0	FL 120
12:49:07	229	0.11	770	0	0	0	0	0	0	0	FL 130
12:50:15	243	0.12	770	0	0	0	0	0	0	0	FL 140
12:51:31	122	0.1	770	0	0	0	0	0	0	0	FL 130
12:52:40	13	0.08	774	100	277	800	5	15500	1000	5	FL 120
12:54:03	14	0.2	786	3000	23	600	5	75	1000	5	FL 130 end of saw tooth
13:00:20	19	0.65	814	300	23	300	6	2500	250	6	Start p descent @ FL130
13:01:27	25	0.81	823	10	2	400	5	8	400	5	FL 120

CLOUD PHYSICS LOG

Flight No. B **Date:** **Operator:** **Page 3 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
13:02:30	29	0.1	823	0	0	0	0	0	0	0	FL 110
13:03:30	18	0.65	835	3000	967	150	1	108	200	1	FL 100 end of P start or run 5.1
13:05:00	5	0.83	859	3000	122	150	1	0	0	0	N.B. 1 – droplets not large drops
13:07:00	47	0.09	863	0	0	0	0	0	0	0	
13:09:00	65	0.1	863	3000	21	75	1	0	0	0	
13:11:00	57	0.8	913	3000	88	550	8	3466	3000	8	
13:12:10	30	1.06	956	1000	136	800	3	14234	6400	3	Mixed, 3 masking 1
13:13:00	120	0.2			108	325	1	1116	400	1	
13:15:00	107	0.38	1037	100	91	650	3	6354	3000	3	Very small droplets also
13:16:21	134	0.11	1062	0	0	0	0	0	0	0	End of run 5.1
13:19:53	13	0.17	1090	0	0	0	0	0	0	0	Start run 6.1 @ FL 120
13:21:00	30	0.09	1091	0	0	0	0	0	0	0	
13:23:0	21	0.3	1144	3000	low	100	1	0	0	0	
13:25:00	575	0.9	1189	3000	383	775	8	26300	2000	8	
13:27:00	54	0.11	1231	0	0	0	0	0	0	0	
13:29:00	241	0.12	1231	0	0	0	0	0	0	0	
13:29:52	105	0.1	1231	0	0	0	0	0	0	0	End of run 6.1
13:33:30	12	0.08	1231	0	0	0	0	0	0	0	Start of run 7.1 @ FL 170
13:35:00	13	0.09	1231	0	0	0	0	0	0	0	
13:37:00	17	0.08	1231	0	0	0	0	0	0	0	
13:39:00	31	0.4	1233	100	89	800	8	5000	2000	8	LARGE ICE PARTICLES
13:41:00	15	0.08	1236	0	0	0	0	0	0	0	
13:42:37	15	0.08	1236	0	0	0	0	0	0	0	End of run 7.1
13:46:47	16	0.11	1236	0	0	0	0	0	0	0	Start run 8.1 @ FL 180
13:48:00	9	0.08	1236	0	0	0	0	0	0	0	
13:50:00	11	0.08	1236	1000	50	575	8	1000	2000	8	Large Ice Particles
13:52:10	17	0.09	1236	0	0	0	0	0	0	0	End of run 8.1
13:55:37	24	0.08	1236	0	0	0	0	0	0	0	Start of run 9.1 @ FL 165
13:57:00	24	0.09	1236	0	0	0	0	0	0	0	
13:59:00	3	0.07	1238	100	100	800	8	800	2000	8	Large ice particles
14:01:00	30	0.08	1238	0	0	0	0	0	0	0	
14:03:00	15	0.08	1238	0	0	0	0	0	0	0	

CLOUD PHYSICS LOG

Flight No. B108 **Date: 05/07/05** **Operator: JT** **Page 4 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
14:04:43	12	0.07	1238	0	0	0	0	0	0	0	End of run 9.1
14:08:36	22	0.08	1238	0	0	0	0	0	0	0	Start run 10.1 @FL 130
14:10:00	19	0.09	1238	100	100	150	8	0	0	0	
14:12:00	27	0.08	1238	0	0	0	0	0	0	0	
14:14:00	21	0.45	1239	100	120	100	5	0	0	0	
14:14:52	51	1.06	1246	3000	33	800	6	3888	2000	8	End of run 10.1
14:18:59	105	0.5	1297	300	130	700	8	6000	800	8	Start of run 11.1 @ FL115
14:20:00	139	0.5	1331	3000	18	100	1	3400	800	8	
14:22:00	26	0.1	1366	0	0	0	0	0	0	0	
14:24:00	9	0.08	1366	0	0	0	0	0	0	0	
14:24:39	33	0.08	1366	0	0	0	0	0	0	0	End run 11.1
14:28:04	25	0.09	1366	0	0	0	0	0	0	0	Start run 12.1 @ FL130
14:30:00	7	0.08	1366	0	0	0	0	0	0	0	
14:32:00	12	0.08	1366	0	0	0	0	0	0	0	
14:34:53	12	0.32	1384	3000	13	475	1/5	375	1000	8	End Run 12.1 Coincident over CB
14:36:00	473	0.62	1427	3000	792	800	8	40000	4000	8	
14:38:00	50	1.2	1464	3000	22	300	1	1450	400	1	
14:40:40	5	0.07	1489	100	50	625	5	2000	800	5	End of run 12.1
14:44:30	51	0.29	1627	3000	25	75	1	0	0	0	Start run 13.1
14:45:30					1200	400	1	12000	1000	1	
14:46:00	47	0.09	1650	0	0	0	0	0	0	0	
14:48:00	124	0.18	1655	10	0	0	0	0	0	0	
14:50:00	47	0.09	1692	0	0	0	0	0	0	0	
14:50:23	47										End of Run 13.1
14:50:30	34	0.15	1694	0	0	0	0	0	0	0	Profile 4 descent @ FL95
14:51:10	35	0.09	1694	0	0	0	0	0	0	0	90
14:52:07	52	0.09	1695	3000	0	0	0	0	0	0	80
14:52:50	32	0.09	1696	0	0	0	0	0	0	0	75 interupt
14:56:25	112	0.09	1696	0	0	0	0	0	0	0	75 restart called P5
14:57:05	130	0.09	1696	7	0	0	0	0	0	0	70
14:58:02	66	0.09	1696	3000	12	175	1	0	0	0	60
14:59:11	22	0.7	1708	3000	679	250	1	16.67	250	1	50 end P4 and start run 14.1

CLOUD PHYSICS LOG

Flight No. B108 **Date: 05/07/05** **Operator: JT** **Page 5 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
15:01:00	125	0.6	1752	3000	1111	275	1	550	250	1	
15:03:00	32	0.8	1803	3000	32	175	1	0	0	0	
15:05:00	46	0.64	1876	3000	30	225	1	0	0	0	
15:07:43	20	0.74	1933	3000	274	200	1	75	200	1	End of run 14.1

Jonny Crosier, Uni of Manchester.

Flight No B108

CCNC LOG

Exp. CWVC

Descending to 20kft

Date 5/7/2005

Page 1 of

ALLEVIATOR GMT		Height	Dyn	STATIC						REMARKS
ON	OFF			1	2	3	4	5		
1146		22kft		1.75	2.5	3.5	4.25	5.5		
			25.53	0.50	0.70	1.06	1.40	2.04	S	
				637 ~~681~~	976	864	1372	2434	D	
				590	556	556	561	567	B	
				2418	2438	2429	2436	2448	R	
				885	886	886	886	896	P	
Nov		16.5kt	25.46	0.49	0.71	1.07	1.40	2.02	S	
				743	905	1155	1156	1652	D	last scan
				603	608	606	609	623	B	
				2409	2408	2409	2410	2411	R	finished at
				932	932	932	932	932	P	15.54 kft.
				1.75	2.5	3.5	4.25	5.5		
1334		16.5kt	26.84	0.49	0.71	1.06	1.40	2.05	S	
				622	694	950	799	1023	D	
				649	640	631	625	622	B	
				2394	2396	2394	2394	2396	R	
				932.4	932.4	932.6	932.6	932.6	P	
									S	
									D	
									B	
									R	
									P	
				1.75	2.5	3.5	4.25	5.5		
									S	
									D	
									B	
									R	
									P	
									S	
									D	
									B	
									R	
									P	

Flight B008 5/7/05
CWVC Tuesday

Tried aligning ADA from scratch, seemed to be going OK but couldn't get couples aligned at all.

Is the ~~the~~ laser aligned with bench?

CPI cleaned windows, PDS levels are now low & image mean optimal.

Other notes :-
Synchronised CPI time with HORACE.

1102:

CPI going crazy - ~~one~~ we are in thick cloud.

1105 :-

CPI ok now - do not trust data ~~from~~ in the above time interval (1102 - 1106)

↓

When in thick water cloud, cpi seems to clog with water and go mad ~~with water~~

↓

When this happens 90 DC levels go high

0·492 10^{-3}

Profile 1 Ostent @ 111507

- we see droplets still in this profile
- then come out of cloud.

we see columns now

↓

we are going into both mixed phase & liquid clouds.

2DC reports snow but CPI doesn't
- CPI is seeing droplets also.
- Perhaps 2DC is more sensitive to snow?

Profile stop 1129 ~~01~~

Profile 1·0 restarted 113431

columns, droplets, plates - polycrystals

End profile 1 113835

Start Run 1 113835

NA much

End Run 1 114132 — can't follow flight summ

Start Run 1-2 114532 FL 220

ice short columns - droplets now

clear of cloud

End Run 1-2 115340

Start 2-1 115756 FL 200
(towards Hilleston).

- mixed particles -
plates & droplets

out of cloud.

End of run 2-1 120335

NOW

Turn away from Hilleston & fly run 165°?

Start run 3-1 120712 FL 165

Snow! droplets
- plates & stellas

clear

- droplets
clear

- ice

End run 3-1 121632 FL 165

Start run 4-1 122125

drop, ice

drops - 2DC sees drops also.
usual plane, columns etc

End an 4.1 122726

Now saw-tooth plan ...

Start saw-tooth profile 2.1 123118

droplets

End profile 2.1

→ Start profile 2.2 123258

no cloud?

End profile 2.2 123525

→ Start profile 2.3 123526

interrupted (traffic above).

123641

→ restarted as (2.4) 123720

nothing 123902

→ Start 25 123909

nothing

End 124208

turn back .. (a lot of air traffic here ...

Saw tooth again

Start profile 3-1 124520

nothing

End 124747

→ Start profile 3.2 124747

nothing

End 125018

→ Start profile 3.3 125018

cloud

droplets

End 125243

columns, mixed
droplets @ top of sawtooth

End
→
Start

columns, plates

droplets
graupel

~~2DC - 3000μm particles~~
columns & small ice (11-11 pa
-6 C

2nd
→ Start no call
ice
- droplets
12 02 14

Start Run 5-1 130349

droplets
2DC say 300μm droplet?
(the 2DC does oversize
droplet however)
as does the CPI...

droplets
↓
larger droplets
↓
some ice
↓
droplet

End Run 5-1 131621

P 

Start Run 6.1 131954

droplets, colums some rimed,

mixed plane etc

mostly ice

End Run 6.1 132955

Start Run 7.1 133334

1338 cloud - small
large ice, colums, p

nothing
End run 7.1 134248 FC165

Start Run 8.1 134652

large ice & small ice
2DC saw 3060 μm ice!

End 135212

Start Run 9.1 135538

ice, all ice

End run 9.1 140448

Start Run 10.1 140845

1409

ice

some colums

End run 10.1 141622

Start Run 11.1 141903

just droplets now
mixed phase 1420
drops

End Run 11.1 142448

Start Run 12.1 142807

droplets
slow

droplets/columns

End Run 12.1 143453
(over thulbourn)

---

droplets
mixed
droplets
etc
↓

} not in a run

Start Run 13.1 144431

droplets; so does DC

24.50
drop

End Run 13.1 145027

Start profile (descent) 4 145037

Droplets

End 145120

Start profile 5 145625

Big droplets

End 145908

Start Run 14.1 145933

Droplets - no ice
drops

End Run 14.1

Stopped recording @ 15:20
→ Heavy rain.

Flight Manager's Instrument Status Log

Flight No. **B**108 Date: 05/07/05

Instrument	Fitted	Operated	Instrument	Fitted	Operated
Navigation			**Cloud Physics**		
INU		**Y**	**Probes**		
XR5M GPS		**Y**	FFSSP		**Y**
Cruciform GPS		**Y**	PCASP		**Y**
Satcom C		**Y**	2D-P		**Y**
Satcom H		**Y**	2D-C		Y
Thermometers			Cloudscope	**N**	**N**
De-Iced Temp		**Y**	SID 1		**Y**
Non De-Iced		**Y**	SID 2	**N**	
Heimann	**N**		HVPS	**N**	
Hygrometers			CIP25	**Y**	**N**
G. Eastern		**Y**	CIP100	**Y**	**N**
J. Williams		**Y**			
Nevzorov		**Y**			
TWC		**Y**			
FWVS	**Y**	**N**	**Racks:**		
Radiometers			INC	**Y**	**N**
Upper Clear	**Y**	**Y**	CCN / CNC	**Y**	**Y**
" Red	**Y**	**Y**	CVI	**Y**	**Y**
" Silicon	**Y**	**Y**			
" JO1D	**Y**	**Y**	**Aerosol**		
Lower Clear	**Y**	**Y**	PSAP	**Y**	**N**
" Red	**Y**	**Y**	Nephelometer	**N**	
" Silicon	**Y**	**Y**	Filters	**Y**	**N**
" JO1D	**N**		AMS	**Y**	**Y**
Large Radiometers					
TAFTS	**N**				
MARSS	**N**				
DEIMOS	**N**		**Others:**		
ARIES	**N**		NIR TDLAS	Y	N
SWS	N		2BT O3	Y	N
Chemistry			VACC	Y	N
Ozone	Y	Y	PEROXIDE	Y	N
ECGC	N		Formaldehyde	Y	N
NOX	Y	Y	ADA	Y	Y
CO	Y	Y	CPI	Y	Y
ORAC	Y	N	NOxy	Y	N
PAN	Y	N	PTRMS	Y	N
PERCA	N	N	Bag Sampling	Y	N
WAS	Y	N			

Faults / Incidents Log

Flight No. B108
Date: 05/07/05

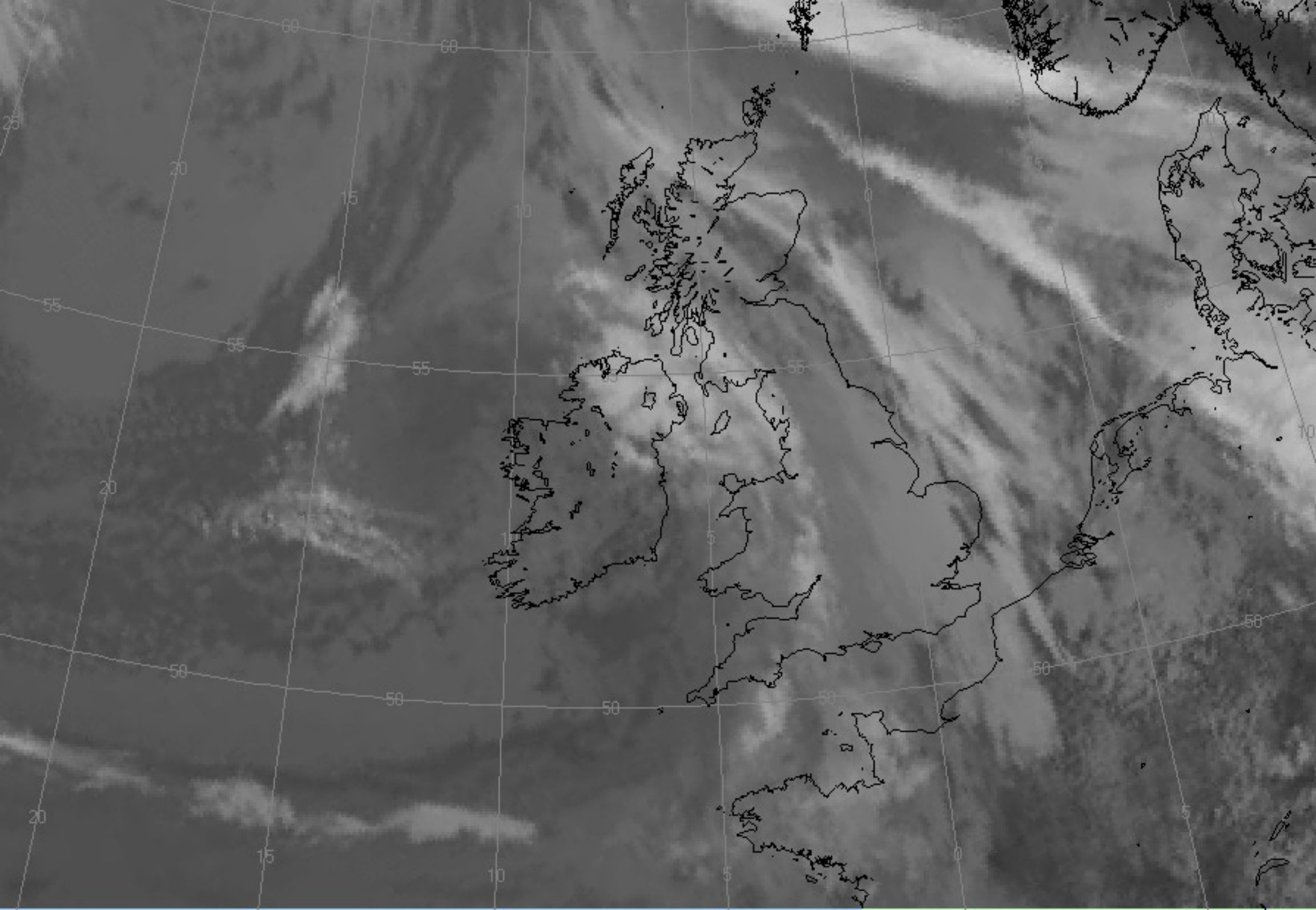
Instruments

1. Video – inboard recorder screen in standby
2. FFC obscured by snow , RFC used as alternative
   Tail anti-ice didn't seem as effective at clearing camera as for B107
3. FM's PC froze once towards end of science, rebooted ok
4. RFC picture on FM's display very dark; video display and recording ok
5. DFC poor focus
6. Deiced Rosemount diverged from Non deiced and then straight lined indicating 90C
   Problem noticed about 13:20
7. no dial tone on SATCOM H phone

Rack instrument status
ADA - not working
CPI, Cloud Physics & AMS – all fine
CVI ok
CCN – good operation

Aircraft

FFC not working before flight, sorted by DFL.
Probable loose connection at camera location.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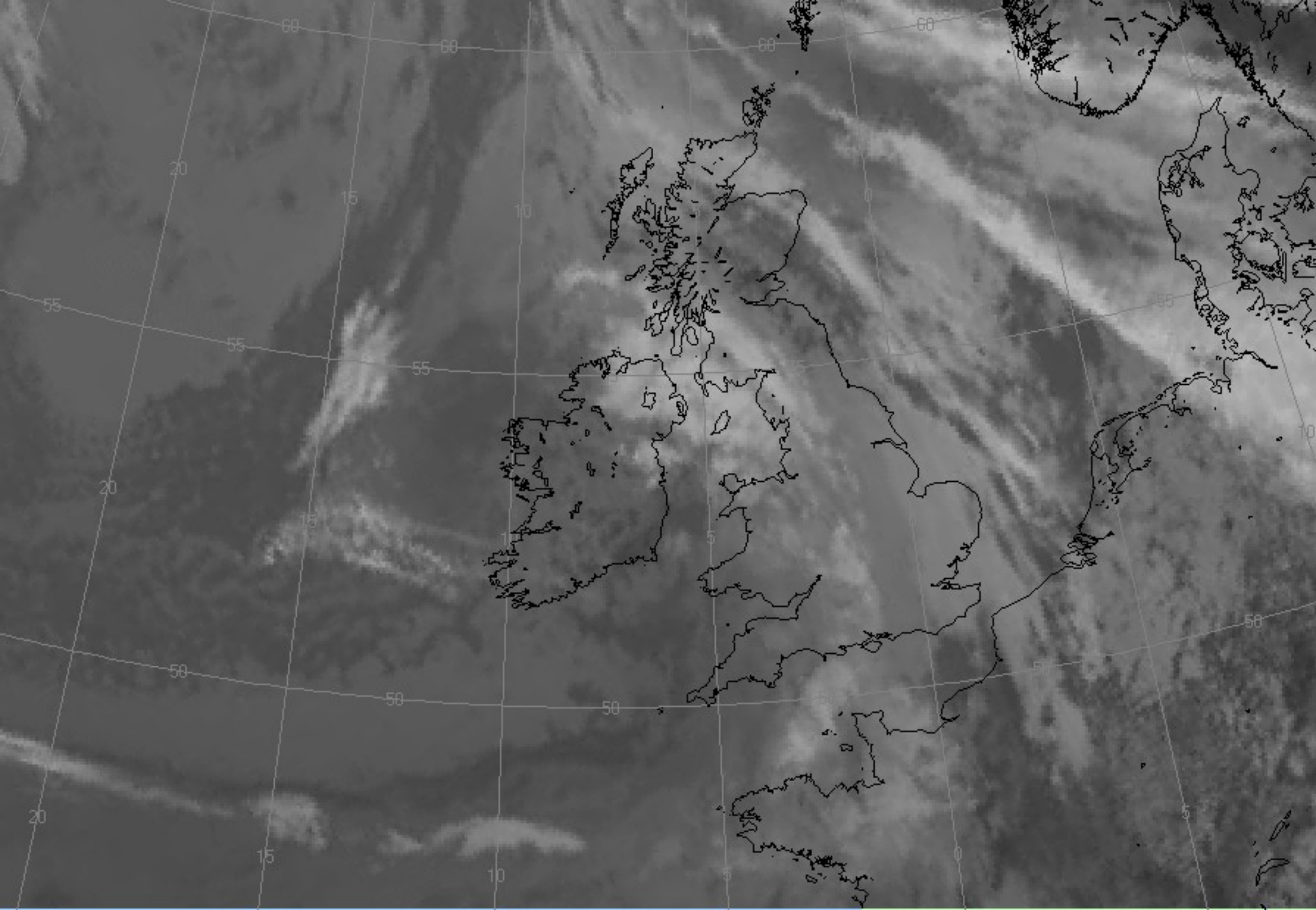
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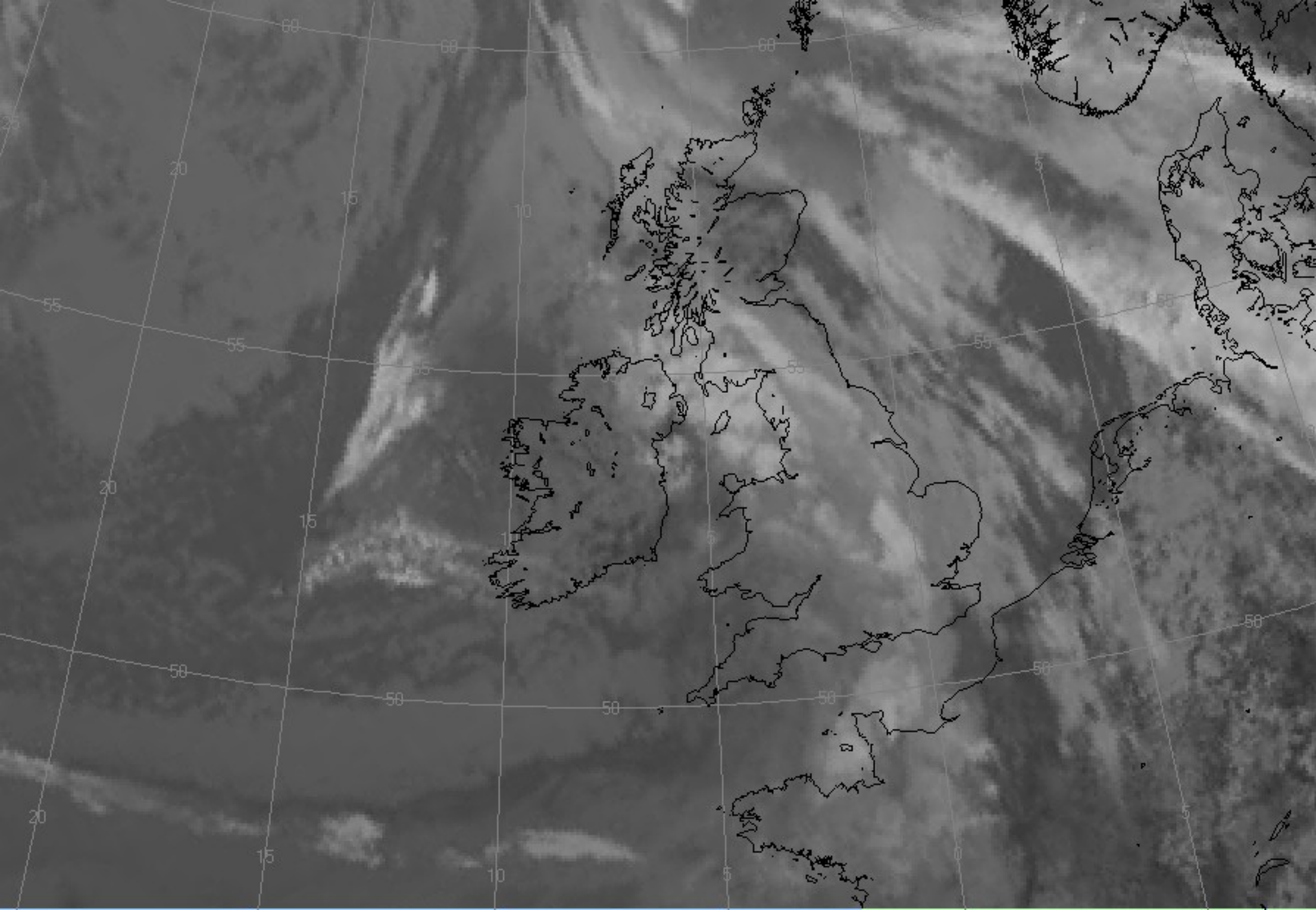
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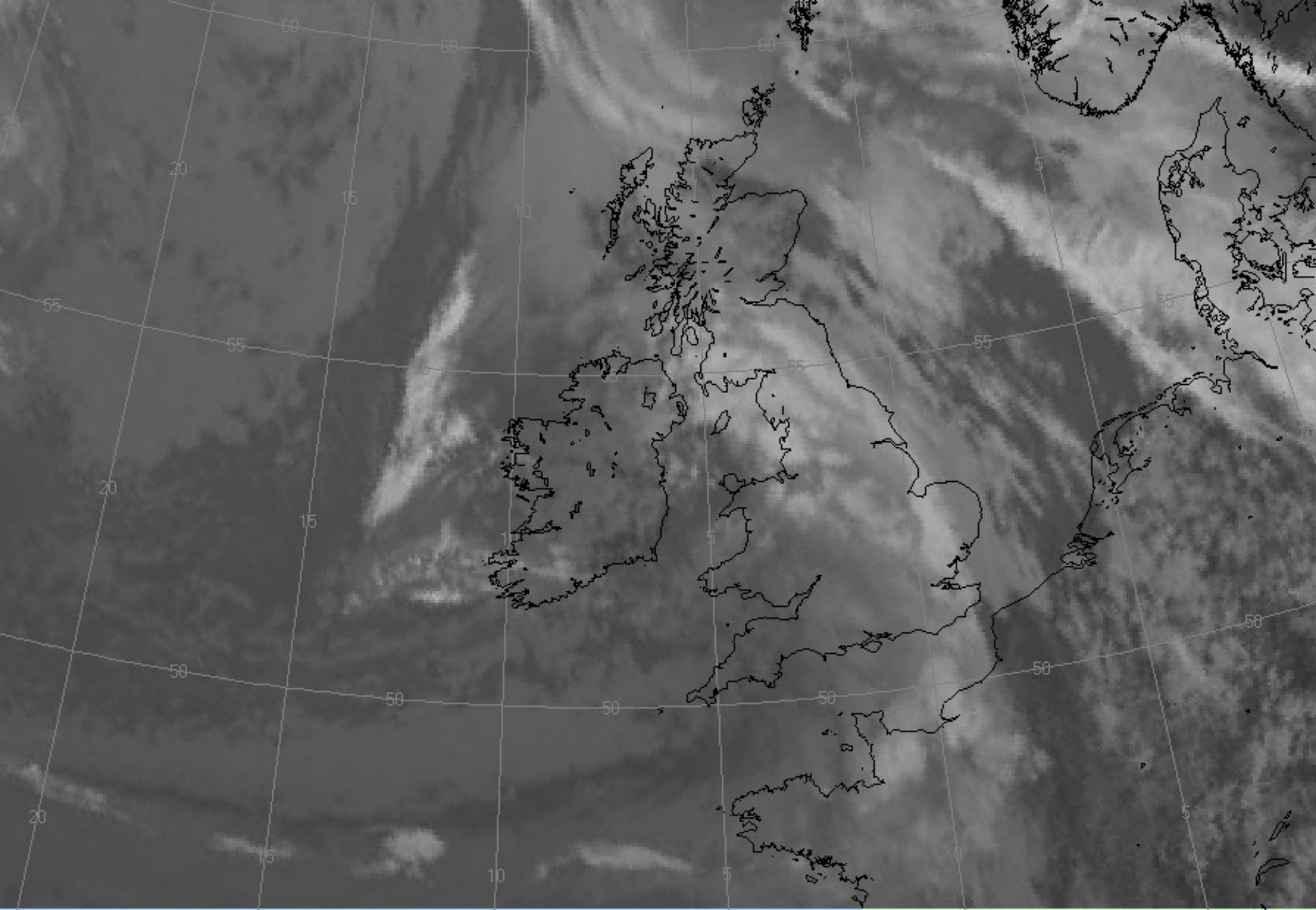
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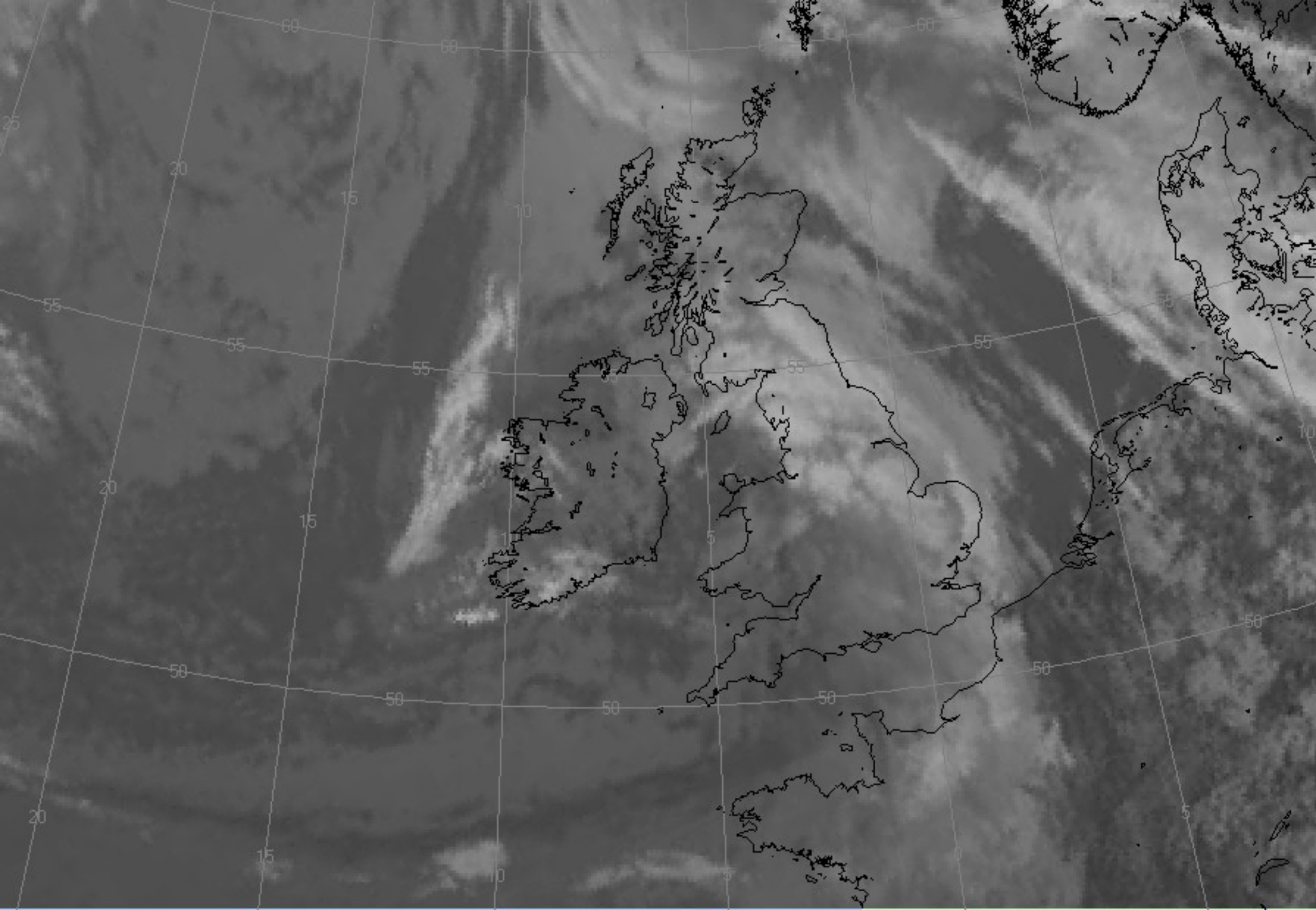
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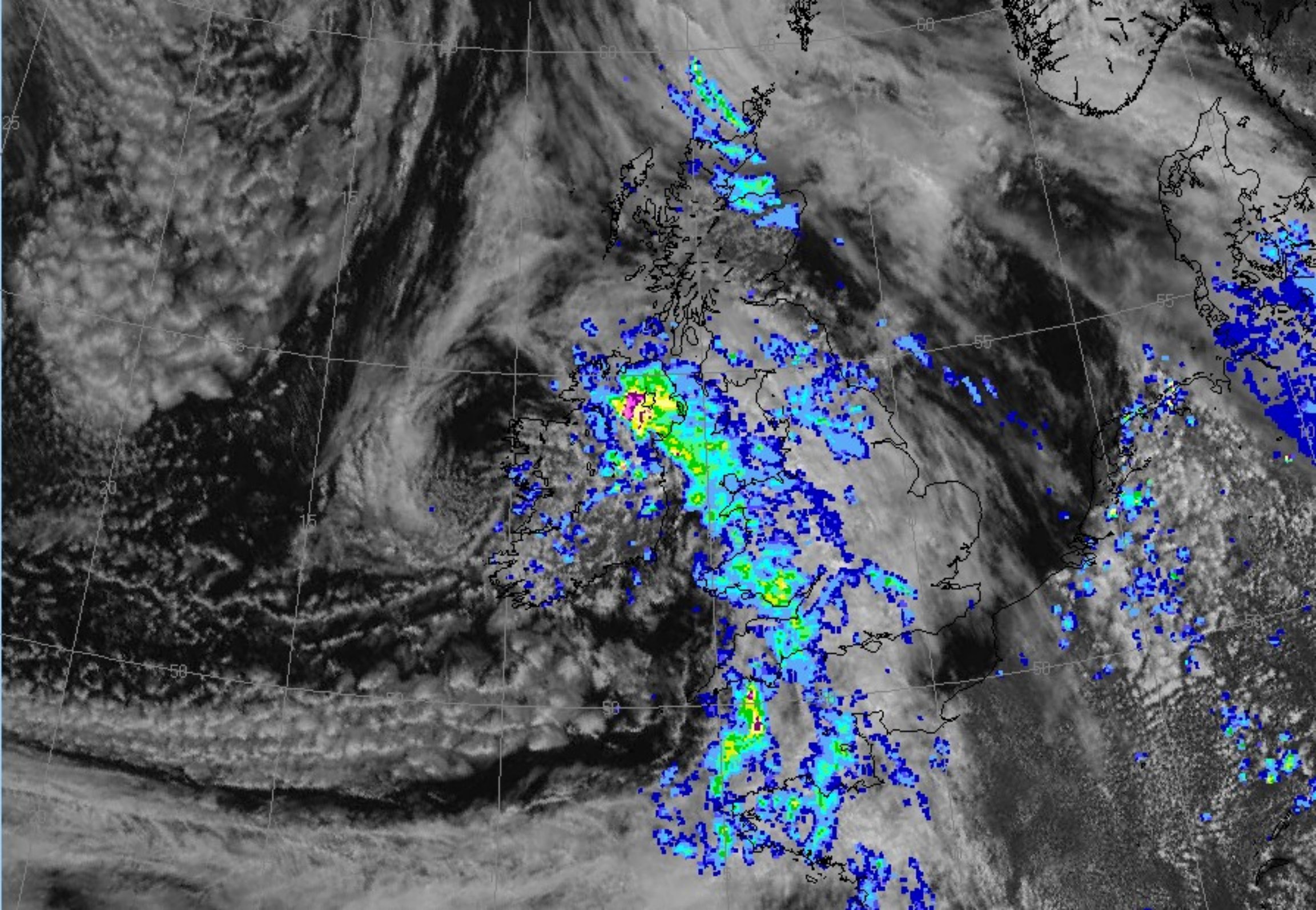

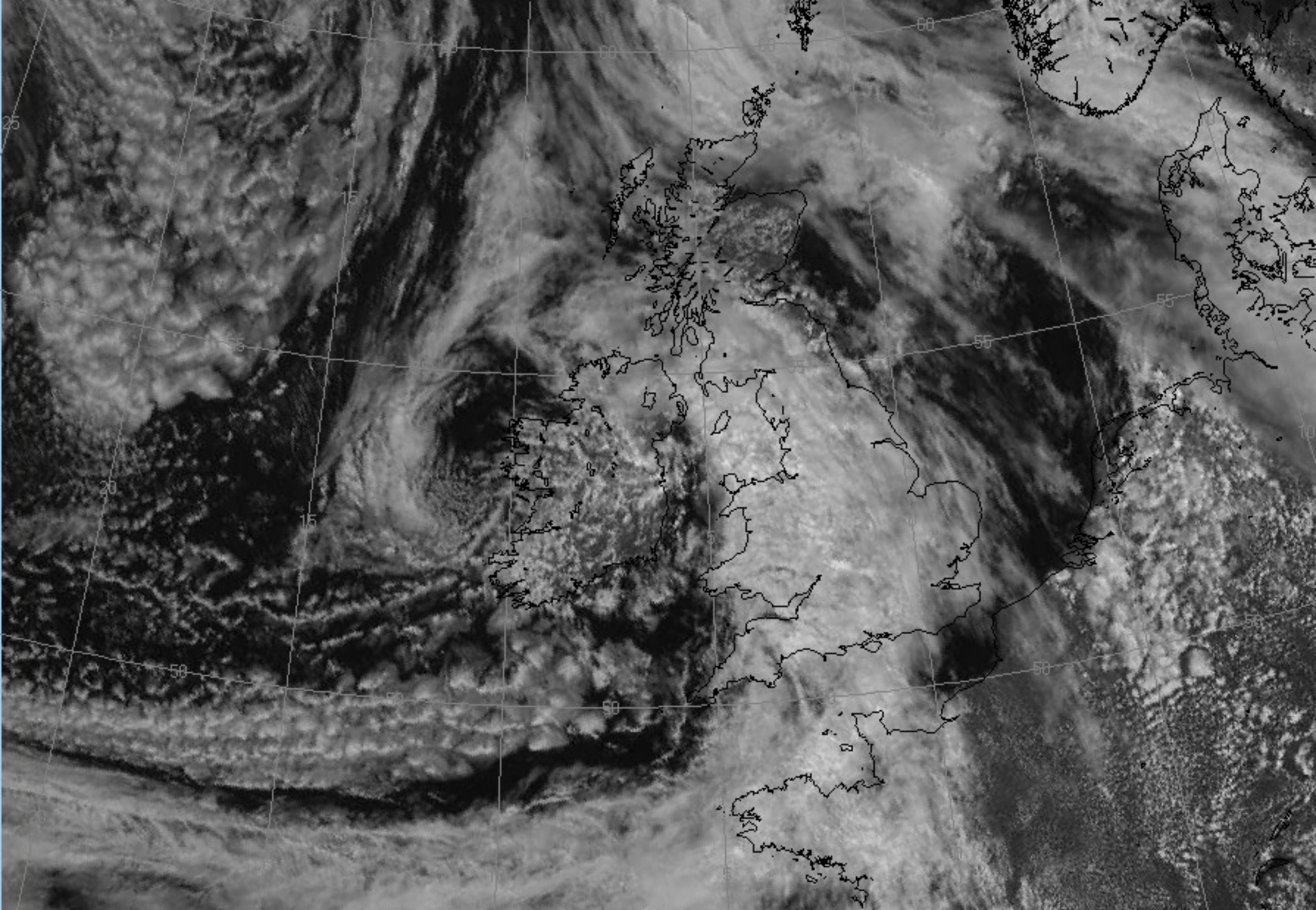
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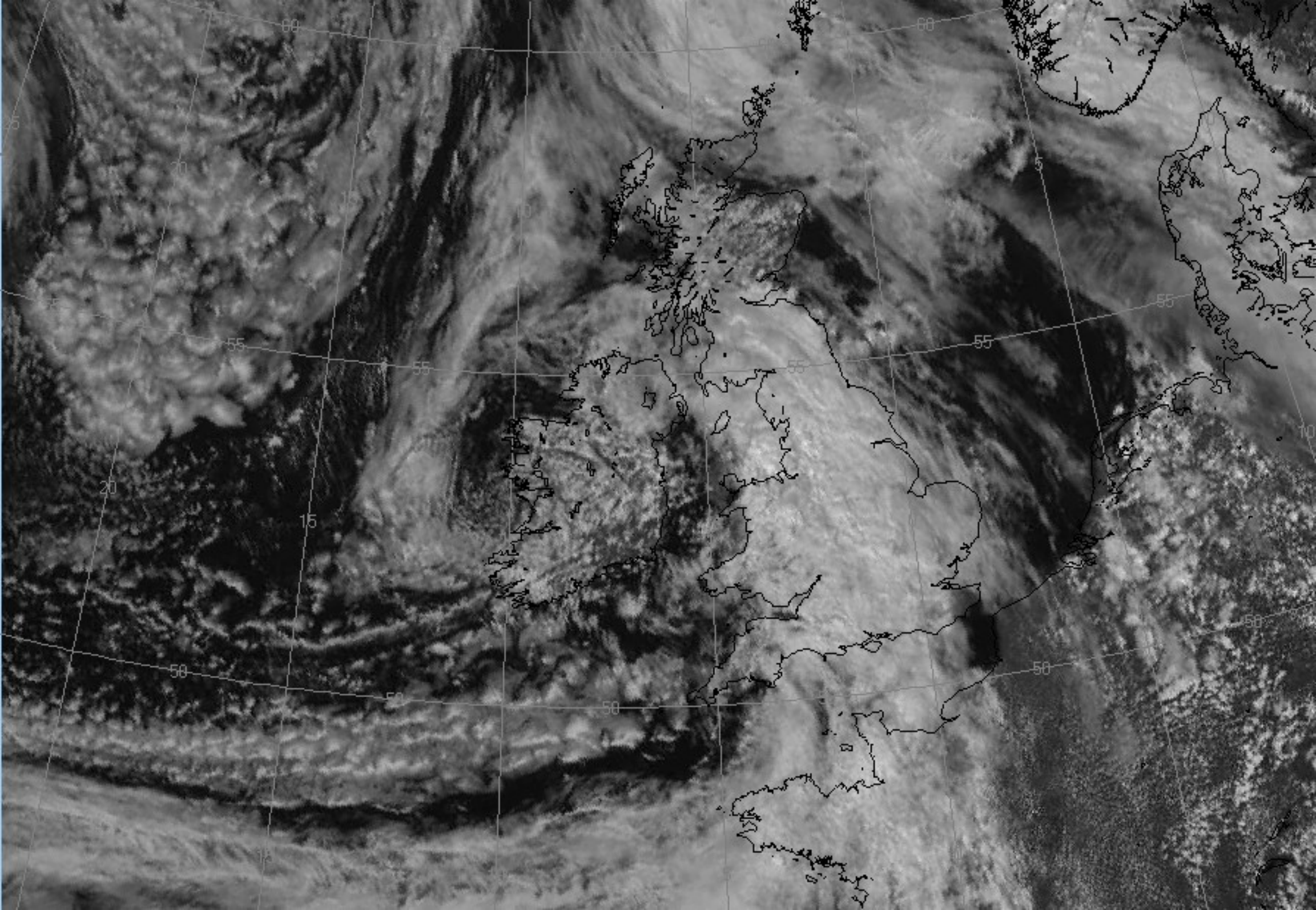
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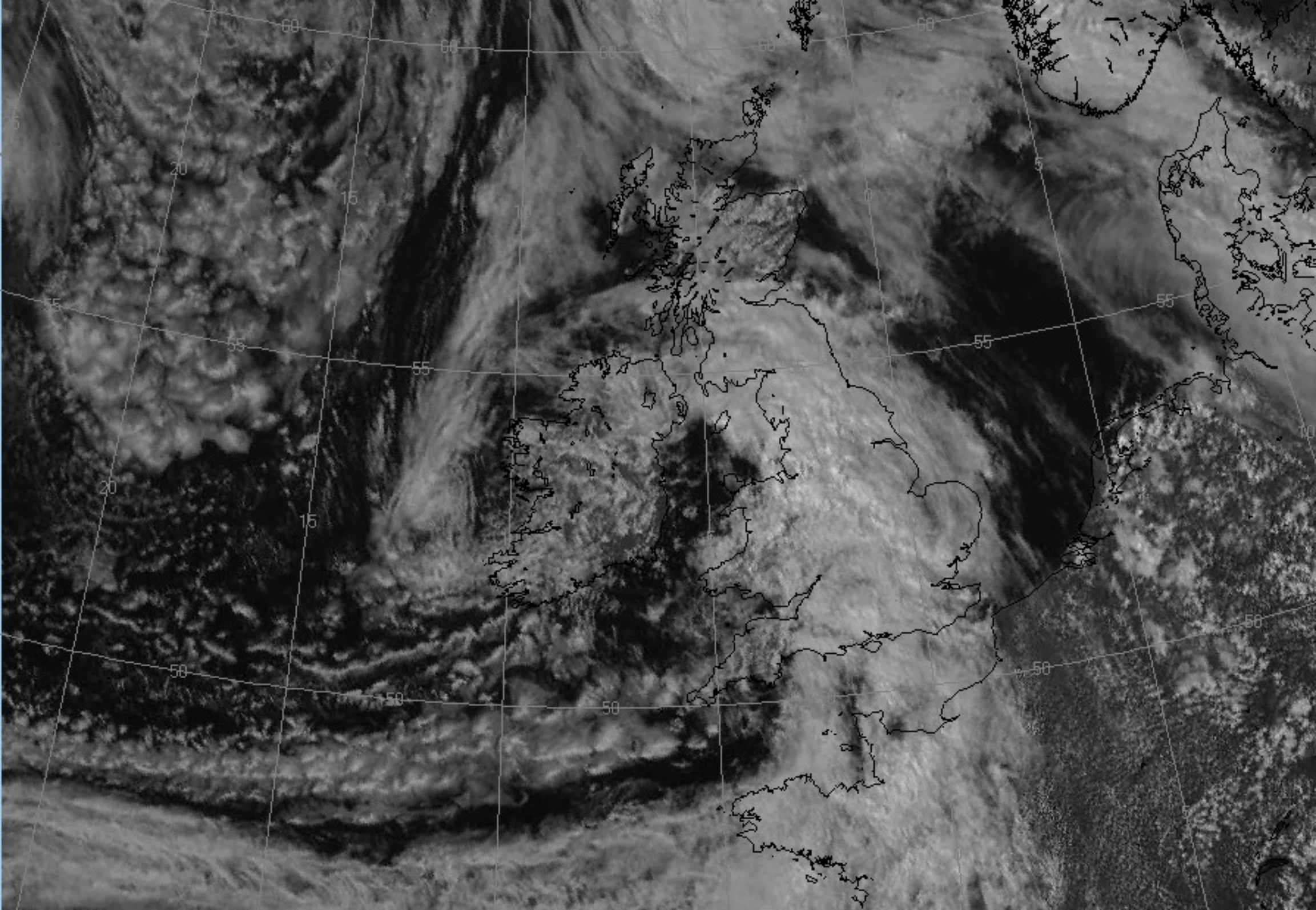
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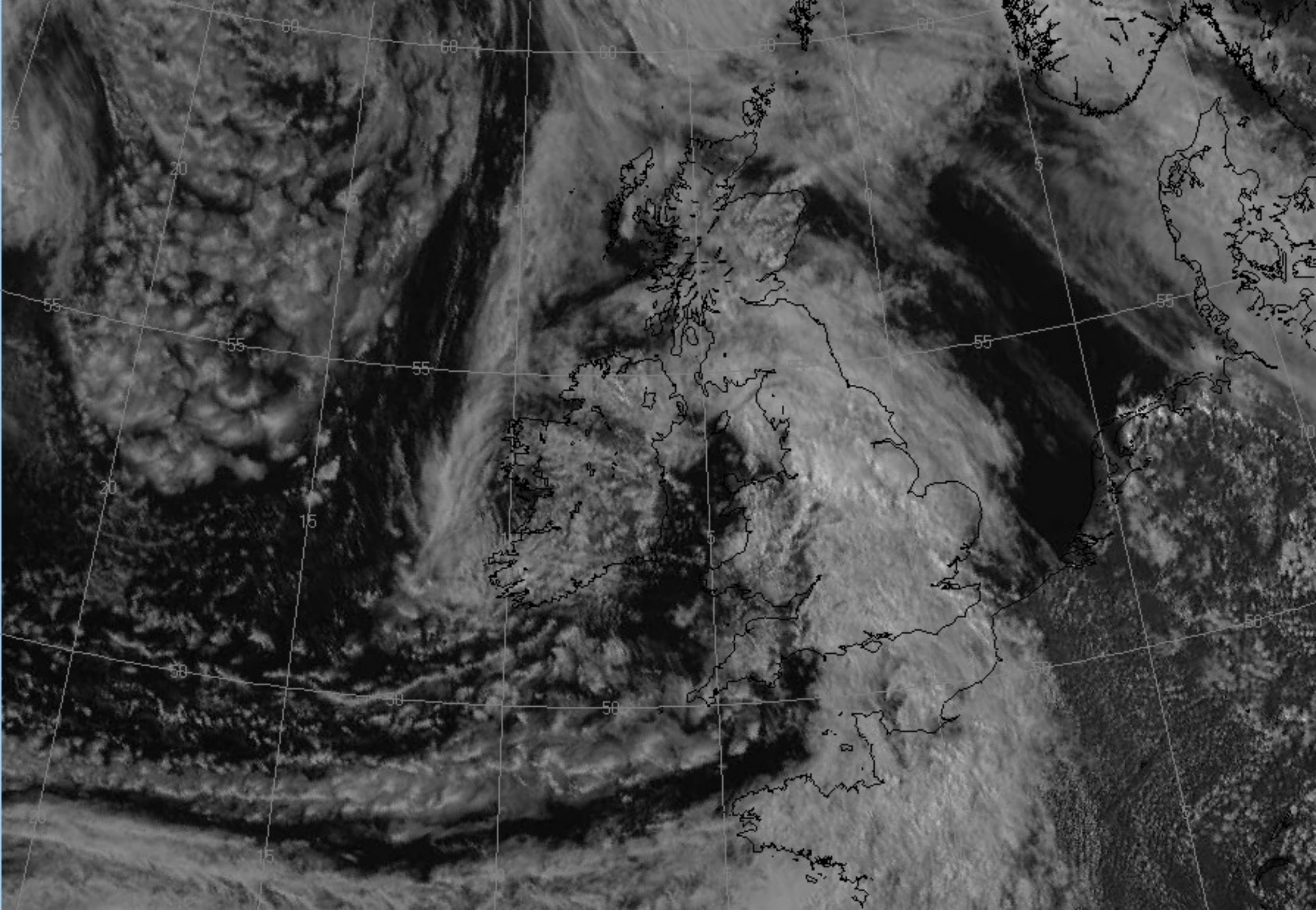
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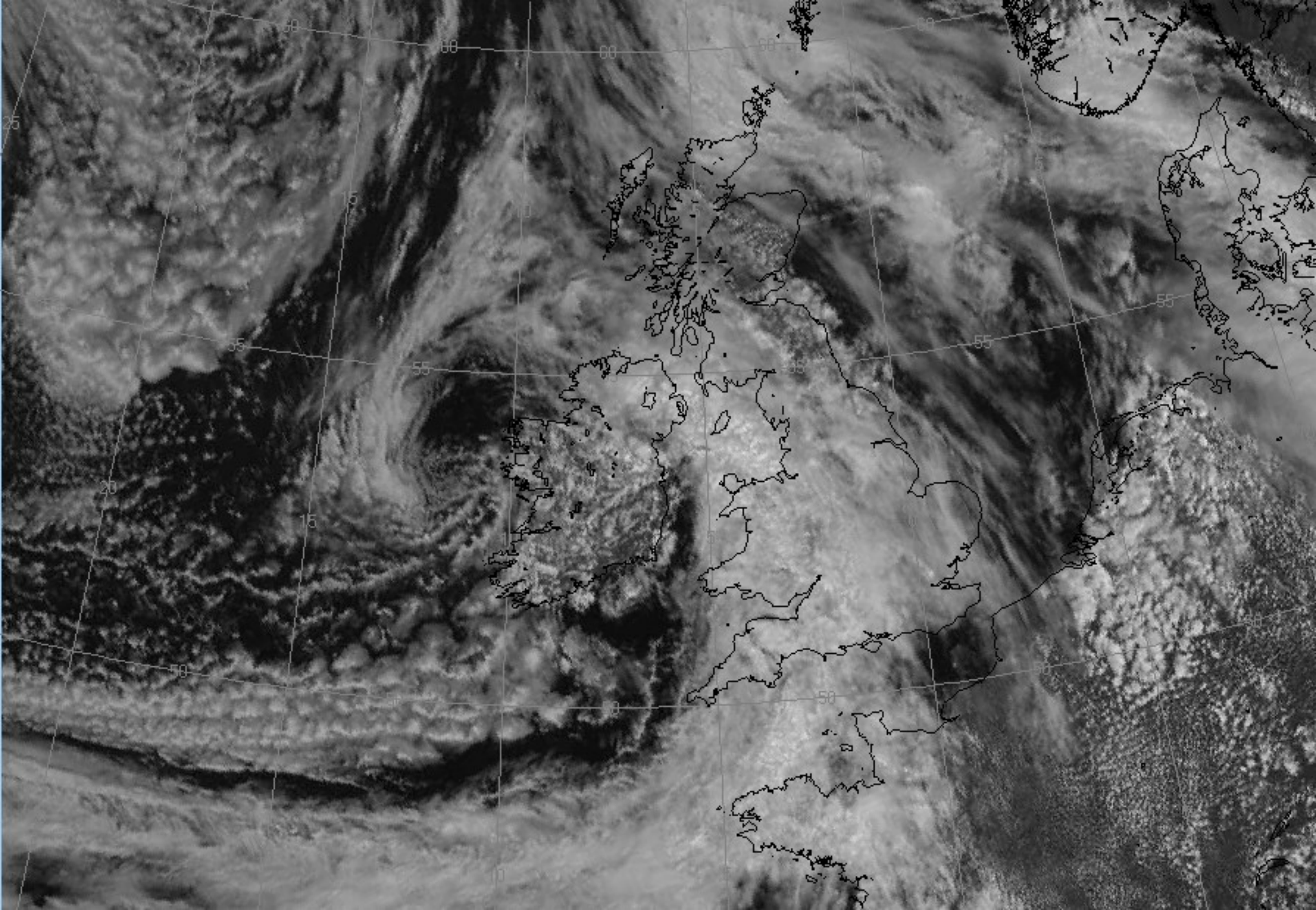
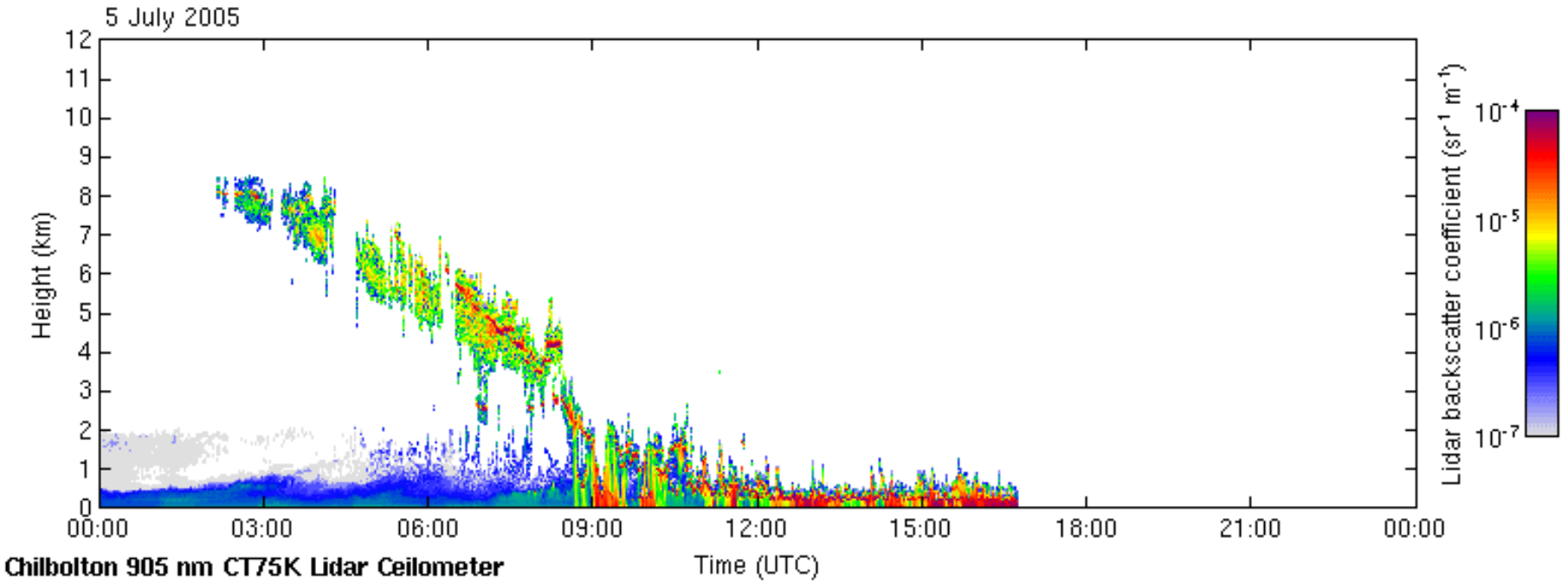
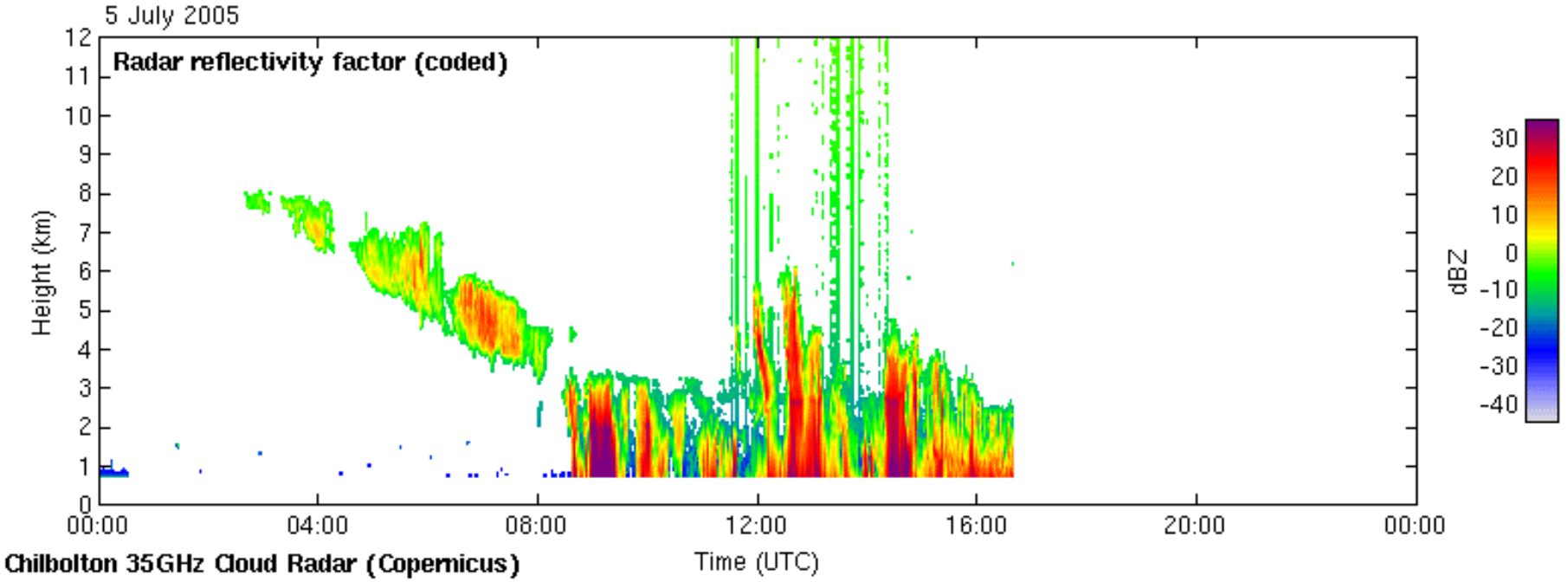




Chilbolton 905 nm CT75K Lidar Ceilometer



Chilbolton 35GHz Cloud Radar (Copernicus)